

IN THE CLAIMS:

1. (Currently Amended) A semiconductor device manufacturing method comprising:

a first step of preparing a semiconductor substrate (11) on which multiple semiconductor devices are formed and thinning the semiconductor substrate (11);

a second step of adhering a reinforcing member (13) ~~through which a part of one surface of the semiconductor substrate (11) is exposed~~ having an opening to ~~[[the]]~~ one surface ~~[[thereof]]~~ of the semiconductor substrate (11) ~~thinned in the first step~~ with an adhering material;

a third step of forming a metallic film (15) for forming an electrode provided in the semiconductor device on ~~[[an exposed]]~~ a portion of one surface of the semiconductor substrate (11) to which the reinforcing member (13) is adhered, the portion being exposed through the opening of the reinforcing member or the other surface of the semiconductor substrate (11); and

a fourth step of removing the reinforcing member (13) from the semiconductor substrate (11) and dicing the semiconductor substrate (11); and

wherein the adhering material ~~[[member]]~~ (13, 25) is formed of material which changes its state at temperature higher than a processing temperature in the third step.

2. (Currently Amended) The semiconductor device manufacturing method according to claim 1,

wherein the reinforcing member (13) has an opening at its center and a ring shape with an outer diameter equal to an outer diameter of the semiconductor substrate (11);

wherein the second step combines an outer periphery of the semiconductor substrate (11) with an outer periphery of the ring-shape reinforcing member (13) to adhere the reinforcing member (13) to one surface of the semiconductor substrate (11) with the adhering material; and

wherein the third step forms the metallic film (15) on the exposed one surface of the semiconductor substrate (11) through the opening of the ring-shape reinforcing member (13).

3. (Original) The semiconductor device manufacturing method according to claim 1, wherein the adhering material is formed of a metal or alloy having a melting point higher than a processing temperature in the third step or heat resistance resin having a melting point or a softening point higher than the processing temperature in the third step.

4. (Original) The semiconductor device manufacturing method according to claim 3, wherein the heat resistance resin is polyimide resin.

5. (Currently Amended) The semiconductor device manufacturing method according to claim 3, wherein in the second step, the adhering material [[layer]] (14, 25) is formed on one surface of the ~~ring-shape~~ reinforcing member (13) which has a ring shape, one surface of the ~~ring-shape~~ reinforcing member (13) is placed on one surface of the semiconductor substrate (11) and the adhering material [[layer]] (14, 25) disposed between the ~~ring-shape~~ reinforcing member (13) and the semiconductor substrate (11) is melted by heating, and the adhering material [[layer]] (14, 25) is hardened by cooling to adhere the ~~ring-shape~~-reinforcing member (13) to the semiconductor substrate (11).

6. (Currently Amended) The semiconductor device manufacturing method according to claim 5,

wherein in the first step, a first tape reinforcing member (12) is adhered to the other surface of the prepared semiconductor substrate (11) with an organic adhesive and one surface of the semiconductor substrate (11) is thinly processed in a state that the first tape reinforcing member (12) is adhered, thereby thinning the semiconductor substrate (11) up to a predetermined thickness;

wherein in the second step, the ~~ring-shape~~-reinforcing member (13) is adhered to one surface of the semiconductor substrate with the adhering material [[layer]] (14) in a state that the first tape reinforcing member (12) is adhered to the other surface of the semiconductor substrate (11); and

wherein in the third step, the metallic film (15) is formed on one surface of the semiconductor substrate (11) through the opening of the ~~ring-shape~~ reinforcing member (13) after removing the first tape reinforcing member (12) from the semiconductor substrate (11) in a state that the ~~ring-shape~~ reinforcing member (13) is adhered to the semiconductor substrate (11),

7. (Currently Amended) The semiconductor device manufacturing method according to claim 6, wherein the adhering material [[layer]] (14) has a melting point lower than heat resistance temperature of the first tape reinforcing member (12).

8. (Currently Amended) The semiconductor device manufacturing method according to claim 6, wherein in the fourth step, a second tape reinforcing member (18) is adhered to the other surface of the semiconductor substrate (11), the ~~ring-shape~~ reinforcing

member (13) is removed from one surface of the semiconductor substrate (11), and the semiconductor substrate (11) is diced into chips (22) that form the respective semiconductor devices,

9. (Currently Amended) The semiconductor device manufacturing method according to claim 8,

wherein the adhering material [[layer]] (14) has a melting point lower than heat resistance temperature of the second tape reinforcing member (18); and the adhering material [[layer]] (14) is melted by heating at temperature lower than heat resistance temperature of the second tape reinforcing member (18), thereby removing the ~~ring-shape~~ reinforcing member (13) from the semiconductor substrate (11).

10. (Original) The semiconductor device manufacturing method according to claim 3,

wherein in the first step, a first tape reinforcing member (12) is adhered to the other surface of the prepared semiconductor substrate (11) with an organic adhesive and one surface of the semiconductor substrate (11) is thinly processed, thereby thinning the semiconductor substrate (11) up to a predetermined thickness; and

wherein in the second step, the semiconductor substrate (11) is fixed onto a stage (24) having a heater and the semiconductor substrate (11) fixed onto the stage (24) is heated, thereby warpage caused on the semiconductor substrate (11) by a difference between a coefficient of linear expansion of the first tape reinforcing member (12) and a coefficient of linear expansion of the semiconductor substrate (11) is reduced.

11. (Currently Amended) A ring-shape reinforcing member, which is used in a manufacturing process of a semiconductor device having a semiconductor substrate (11) thinly processed to a predetermined thickness,

said ring-shaped reinforcing member having an opening at its center, having a ring shape with an outer diameter equal to an outer diameter of the semiconductor substrate (11), and being adhered to one surface of the semiconductor substrate (11) with an adhering material, thereby enhancing strength of the semiconductor substrate (11) reduced by thinly processing, the opening of said ring-shaped reinforcing member exposing the one surface of the semiconductor substrate (11) and having such a diameter as enabling a metallic film to be formed on the one surface of the semiconductor substrate (11).

12. (Currently Amended) The ring-shape reinforcing member according to claim 11, wherein the ring-shape reinforcing member has a thickness larger than the [[a]] predetermined thickness of the thinly processed semiconductor substrate [[device]].

13. (Original) The ring-shape reinforcing member according to claim 12, wherein the ring-shape reinforcing member is formed of the same material as that of the semiconductor substrate (11) and has a coefficient of linear expansion equal to that of the semiconductor substrate (11).

14. (New) A semiconductor device manufacturing method comprising:
a first step of preparing a semiconductor substrate (11) on which multiple semiconductor devices are formed and thinning the semiconductor substrate (11);

a second step of adhering a reinforcing member (13) through which a part of one surface of the semiconductor substrate (11) is exposed to the one surface thereof with an adhering material;

a third step of forming a metallic film (15) for forming an electrode provided in the semiconductor device on an exposed portion of one surface of the semiconductor substrate (11) or the other surface of the semiconductor substrate (11); and

a fourth step of removing the reinforcing member (13) from the semiconductor substrate (11) and dicing the semiconductor substrate (11),

wherein the adhering material (13, 25) is formed of material which changes its state at temperature higher than a processing temperature in the third step,

wherein the adhering material is formed of a metal or alloy having a melting point higher than the processing temperature in the third step or heat resistance resin having a melting point or a softening point higher than the processing temperature in the third step,

wherein in the second step, the adhering material (14, 25) is formed on one surface of the reinforcing member (13) which has a ring-shape,

wherein one surface of the reinforcing member (13) is placed on one surface of the semiconductor substrate (11) and the adhering material (14, 25) disposed between the reinforcing member (13) and the semiconductor substrate (11) is melted by heating, and

wherein the adhering material (14, 25) is hardened by cooling to adhere the reinforcing member (13) to the semiconductor substrate (11).

15. (New) A semiconductor device manufacturing method comprising:

a first step of preparing a semiconductor substrate (11) on which multiple semiconductor devices are formed and thinning the semiconductor substrate (11);

a second step of adhering a reinforcing member (13) through which a part of one surface of the semiconductor substrate (11) is exposed to the one surface thereof with an adhering material;

a third step of forming a metallic film (15) for forming an electrode provided in the semiconductor device on an exposed portion of one surface of the semiconductor substrate (11) or the other surface of the semiconductor substrate (11); and

a fourth step of removing the reinforcing member (13) from the semiconductor substrate (11) and dicing the semiconductor substrate (11),

wherein the adhering material (13, 25) is formed of material which changes its state at temperature higher than a processing temperature in the third step,

wherein the adhering material is formed of a metal or alloy having a melting point higher than the processing temperature in the third step or heat resistance resin having a melting point or a softening point higher than the processing temperature in the third step,

wherein in the first step, a first tape reinforcing member (12) is adhered to the other surface of the prepared semiconductor substrate (11) with an organic adhesive and one surface of the semiconductor substrate (11) is thinly processed, thereby thinning the semiconductor substrate (11) up to a predetermined thickness, and

wherein in the second step, the semiconductor substrate (11) is fixed onto a stage (24) having a heater and the semiconductor substrate (11) fixed onto the stage (24) is heated, thereby warpage caused on the semiconductor substrate (11) by a difference between a coefficient of linear expansion of the first tape reinforcing member (12) and a coefficient of linear expansion of the semiconductor substrate (11) is reduced,

16. (New) A ring-shape reinforcing member, which is used in a manufacturing process of a semiconductor device having a semiconductor substrate (11) thinly processed to a predetermined thickness,

wherein said ring-shaped reinforcing member has an opening at its center, has a ring shape with an outer diameter equal to an outer diameter of the semiconductor substrate (11), and is adhered to one surface of the semiconductor substrate (11) with an adhering material, thereby enhancing strength of the semiconductor substrate (11) reduced by thinly processing,

wherein the ring-shape reinforcing member has a thickness larger than the predetermined thickness of the thinly processed semiconductor substrate, and

wherein the ring-shape reinforcing member is formed of the same material as that of the semiconductor substrate (11) and has a coefficient of linear expansion equal to that of the semiconductor substrate (11).

17. (New) The ring-shape reinforcing member according to claim 16,
wherein the adhering material is formed of a metal or alloy having a melting point higher than a processing temperature for forming a thin film on the semiconductor substrate or heat resistance resin having a melting point or a softening point higher than the processing temperature.